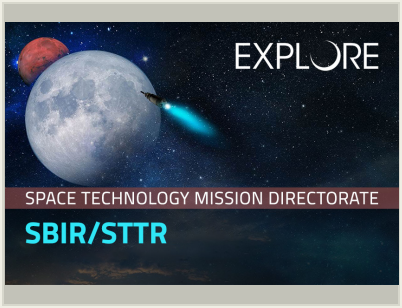
Anytime Summarization for Remote Robot Operations, Phase I

Completed Technology Project (2012 - 2013)

Project Introduction

NASA plans to use intelligent planetary rovers to improve the productivity and safety of human explorers. A key challenge in using robots to support human exploration is orienting remote personnel about robot operations as latency and communication constraints make real-time monitoring impractical. Communication bandwidth will be limited, making it essential to downlink important information early. Periods with no communication will require ground operations to catch up quickly when communication resumes. Consequently ground operators can no longer rely on eyes-on monitoring to orient them about robot performance and progress on mission objectives. Summary measures are needed to identify what progress the robot has made and, when progress is impeded, to indicate what went wrong. Trending measures also are needed that determine how well robotic assets are being utilized and identify opportunities to improve robot productivity. TRACLabs and Brigham Young University propose to develop software for anytime summarization that orients remote personnel quickly about rover operations performed without continuous, high bandwidth communication. An anytime summary will characterize progress on robot operations using whatever data has been downlinked when the summary request is made. It will compute performance measures that give an overview of robot mission success and the efficiency and effectiveness of robot operations, and will provide a launch point for interactive exploration of performance data. Because the quality of an anytime summary is affected by the latency in data availability for ground processing, we will investigate what summary information should be pre-computed by the robot, and the preferred order in which information should be downlinked. During Phase I we will design and prototype software for anytime summarization. We will evaluate this design for use in rover operations using NASA IRG robots. Phase I will produce a design for implementation in Phase II.



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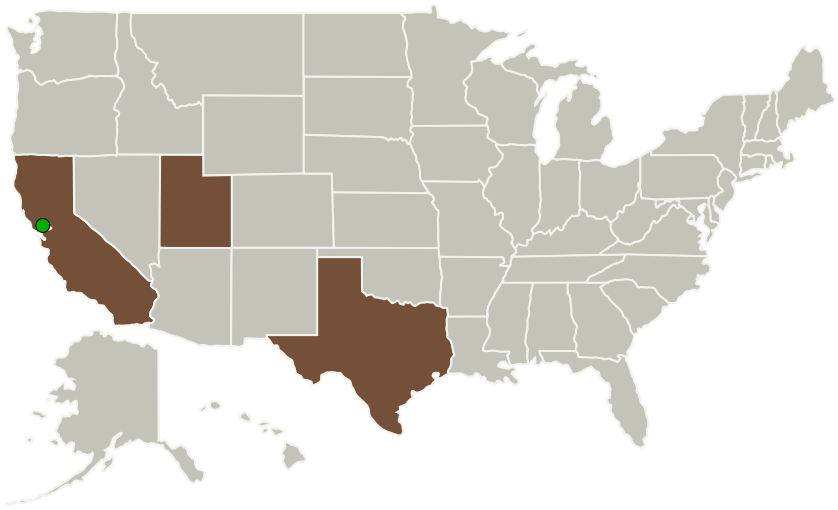
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
TRACLabs, Inc.	Lead Organization	Industry	Webster, Texas
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Brigham Young University-Provo	Supporting Organization	Academia	Provo, Utah

Primary U.S. Work Locations	
California	Texas
Utah	

Project Transitions

February 2012: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TRACLabs, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

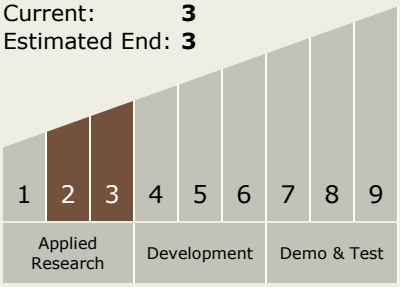
Carlos Torrez

Principal Investigator:

Debra L Schreckenghost

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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February 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140336)*

Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.2 Reasoning and Acting
    - TX10.2.4 Execution and Control

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System